

Show all work on a separate sheet of paper. Make sure to study your notes and homework as well.

1. Divide the following and express the answer as a quotient plus remainder:

a)  $(6x^2 - 7x - 5) \div (3x - 5)$

e)  $(x^4 - 5x + 10) \div (x + 3)$

b)  $(2x^2 + 13x - 8) \div (x - \frac{1}{2})$

f)  $(3x^3 - 2x^2 + 4x + 7) \div (x^2 + 2x)$

c)  $(3x^3 + 5x^5 + 1) \div (x + 2)$

g)  $(x^4 - 3x^3 + 6x - 18) \div (x^2 + 2)$

d)  $(7x^2 - 23x + 6) \div (x - 3)$

2. Show that  $(x - 2)$  is a factor of  $P(x) = x^3 - 3x^2 - 10x + 24$ , and find the other two factors.

3. What is the remainder when  $3x^{107} + 14x^{35} - 16x$  is divided by  $(x - 1)$ ?

4. What is the remainder when  $14x^{10} - 2x^3 - 17$  is divided by  $(x + 2)$ ?

5. Determine if  $(x + 3)$  is a factor of  $f(x) = x^3 + x^2 - 5x + 3$

6. Determine if  $(x + 1)$  is a factor of  $f(x) = x^3 - 13x^2 + 23x - 11$

7. List all of the possible rational roots for each of the following polynomials:

a)  $f(x) = 3x^2 + 2x - 1$

c)  $f(x) = -2x^2 + 5x + 3x^3 - 8$

b)  $f(x) = x^6 - 64$

d)  $f(x) = 50x - 25 + 4x^5 + 30x^3 + 4x^5$

8. If  $(x + 16)$  is a factor of  $f(x)$  then what is one of the zeros?

9. If  $(2x - 3)$  is a factor of  $f(x)$  then what is one of the roots?

10. If  $f(x) = (x - 3)(2x - 1)(3 + x)$  then what are the roots?

11. If  $f(8) = 0$ , what is one of the factors of  $f(x)$ ?

12. If  $f\left(\frac{3}{2}\right) = 0$ , what is one of the factors of  $f(x)$ ?

13. Determine algebraically whether the following functions are even, odd, or neither

a)  $f(x) = -3x^2 + 4$

b)  $f(x) = 2x^3 - 4x$

c)  $f(x) = \frac{x}{x^2 - 1}$

d)  $f(x) = (x - 2)^2 + 1$

14. Write an equation for the indicated transformation given the function

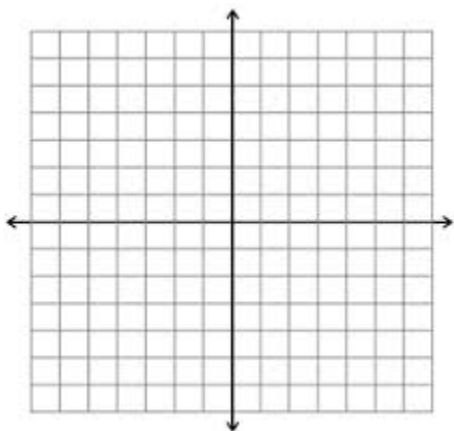
a.  $f(x) = \sqrt{x}$ ; shift to the left 2, vertical stretch by a factor of 3, shift down 4 units

b.  $f(x) = x^3$ ; reflect over the y-axis, horizontal shrink by a factor of 2

15. Describe each transformation in terms of the original function then graph each function. State the domain, range, and any x- or y-intercepts.

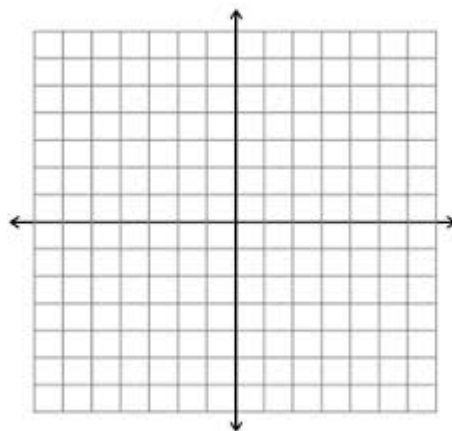
a. Original  $f(x) = |x|$

$$f(x) = |2x|$$



b. Original  $f(x) = x^3$

$$f(x) = \frac{1}{2}x^3$$



16. Use the given zero(s) to find all of the zeros for each of the following:

a.  $f(x) = 5x^4 - 46x^3 + 84x^2 - 50x + 7$ ; zeros: 7, 1

b.  $f(x) = 2x^3 + 9x^2 + 19x + 15$ ; zero:  $-\frac{3}{2}$

17. Use the given root(s) to find the complete factorization for each of the following:

a.  $f(x) = 3x^3 + 11x + 5x - 3$ ; zero: -1

b.  $f(x) = 3x^4 - 24x^2 - 6x + 5 - 10x^3$ ; zero: -1 (double root)

